

Solve each equation. Check for extraneous solutions.

1. $|x+2| = -x+4$

$$\begin{aligned} x+2 &= -x+4 & x+2 &= x-4 \\ 2x &= 2 & \cancel{0x} &= -6 \\ \boxed{x=1} & & & \end{aligned}$$

2. $|x-4| + 3 = 2x+1$

$$\begin{aligned} |x-4| &= 2x-2 \\ x-4 &= 2x-2 & x-4 &= -2x+2 \\ \cancel{-2x} & & 3x &= 6 \\ & & \boxed{x=2} & \end{aligned}$$

3. $|2x+1| = x+2$

$$\begin{aligned} 2x+1 &= x+2 & 2x+1 &= -x-2 \\ x &= 1 & 3x &= -3 \\ & & x &= -1 \\ \boxed{x = \pm 1} & & & \end{aligned}$$

4. $|x-3| - 7 = 12x$

$$\begin{aligned} |x-3| &= 12x+7 \\ x-3 &= 12x+7 & x-3 &= -12x-7 \\ -10 &= 11x & 13x &= -4 \\ \cancel{x} &= \frac{10}{11} & \boxed{x = \frac{-4}{13}} & \end{aligned}$$

5. $|x+4| - 6 = 3x+14$

$$\begin{aligned} |x+4| &= 3x+20 \\ x+4 &= 3x+20 & x+4 &= -3x-20 \\ -16 &= 2x & 4x &= -24 \\ \cancel{-x} &= x & \boxed{x = -6} & \end{aligned}$$

6. $|x-2| = 3x-7$

$$\begin{aligned} x-2 &= 3x-7 & x-2 &= -3x+7 \\ 5 &= 2x & 4x &= 9 \\ \boxed{\frac{5}{2} = x} & & \cancel{x = \frac{9}{4}} & \end{aligned}$$

Solve each inequality. Write answers in interval notation.

7. $7|-7-n| + 5 \leq 54$

$$\begin{aligned} 7|-7-n| &\leq 49 \\ |-7-n| &\leq 7 \\ -7-n &= 7 & -7-n &= -7 \\ n &= -14 & n &= 0 \\ \text{Number line: } & \bullet & \bullet & \\ & -14 & 0 & \end{aligned}$$

$\boxed{[-14, 0]}$

8. $-9|10+6x| + 4 > -14$

$$\begin{aligned} -9|10+6x| &> -18 \\ |10+6x| &< 2 \\ 10+6x &= 2 & 10+6x &= -2 \\ 6x &= -8 & 6x &= -12 \\ x &= \frac{-4}{3} & x &= -2 \\ \text{Number line: } & \bullet & \bullet & \\ & -2 & \frac{-4}{3} & \end{aligned}$$

$\boxed{(-2, -4/3)}$

9. $2|2x-3| + 4 > 2x$

$$\begin{aligned} 2|2x-3| &> 2x-4 \\ |2x-3| &> x-2 \\ 2x-3 &= x-2 & 2x-3 &= -x+2 \\ x &= 1 & 3x &= 5 \\ & & x &= 5/3 \\ \text{Number line: } & \leftarrow & \bullet & \bullet & \rightarrow \\ & & 1 & 5/3 & \end{aligned}$$

$\boxed{(-\infty, 1) \cup (5/3, \infty)}$

10. $-\frac{1}{2}|4-x| + 1 \leq x+3$

$$\begin{aligned} -\frac{1}{2}|4-x| &\leq x+2 \\ |4-x| &\geq -2x-4 \\ 4-x &= -2x-4 & 4-x &= 2x+4 \\ x &= -8 & 0 &= 3x \\ & & 0 &= x \\ \text{Number line: } & \bullet & \bullet & \rightarrow \\ & -8 & 0 & \end{aligned}$$

$\boxed{[-8, \infty)}$

11. $3|\frac{1}{2}-x| - 3 \leq 15x$

$$\begin{aligned} 3|\frac{1}{2}-x| &\leq 15x+3 \\ |\frac{1}{2}-x| &\leq 5x+1 \\ \frac{1}{2}-x &= 5x+1 & \frac{1}{2}-x &= -5x-1 \\ 1-2x &= 10x+2 & 1-2x &= -10x-2 \\ -1 &= 12x & 6x &= -3 \\ -\frac{1}{12} &= x & x &= -\frac{3}{6} \\ \text{Number line: } & \bullet & \bullet & \\ & -\frac{1}{12} & -\frac{3}{6} & \end{aligned}$$

12. $-2|5-3x| + 3 \geq 4x-5$

$$\begin{aligned} -2|5-3x| &\geq 4x-8 \\ |5-3x| &\leq -2x+4 \\ 5-3x &= -2x+4 & 5-3x &= 2x-4 \\ 1 &= x & 9 &= 5x \\ & & \frac{9}{5} &= x \\ \text{Number line: } & \bullet & \bullet & \\ & 1 & 9/5 & \end{aligned}$$